m the Author

AN INQUIRY

INTO THE

PREVALENCE OF SMALL-POX IN KILMARNOCK

IN THE LAST CENTURY.

BY

JOHN C. M'VAIL, M.D.,

KILMARNOCK.

READ BEFORE THE PHILOSOPHICAL SOCIETY,

GLASGOW, 1st February, 1882.

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An Inquiry into the Prevalence of Small-pox in Kilmarnock in the Last Century. By John C. M'Vail, M.D., Kilmarnock.*

[Read before the Society, 1st February, 1882.]

The historian of the social life of the nineteenth century will probably devote a chapter to the description of a phenomenon to which he may have some difficulty in giving a name. He may say that it flourished chiefly in the decade through which we have just passed, and that it consisted of a peculiar social craze or mania, the chief symptom of which consisted in a strong tendency on the part of those affected to unite themselves into societies for the purpose of abolishing certain well-established and approved customs and procedures. The only essential qualities in the objects to be crusaded against seemed to be, he might say, that, in the opinion of those most intimately acquainted with the matter, they were of great benefit to the public health and welfare, and ought not to be interfered with. These societies are at present best known to the public by the prefix "Anti," the three chief being the Anti-Vivisection Society, the Anti-Contagious Diseases Acts Society, and the Anti-Vaccination Society. How this social malady can be cured is not very obvious. But I am quite sure of this, that if the class of sufferers termed (owing to their symptoms, for a pathological nomenclature is not yet attainable in mental disorders) Anti-Vaccinationists, could have themselves placed in an asylum called up from the past by some magic wand, and consisting of the town of Kilmarnock as it was in the last century, a very short residence there would entirely cure them of their disease.

In the beginning of the year 1728, the schoolmaster of Kilmarnock, who seems to have been a man considerably in advance of his time, determined to keep a register of mortality for his parish, and the result of his decision is a beautifully-written old volume, which begins as follows:—

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* For much valuable aid in various matters connected with the preparation of this paper I am indebted to Mr. James Rose, Registrar of Kilmarnock.

> “ Mr. Patrick Paisley, and Mr. Lawrence Hill, Ministers,
> “ March, 1728. This register is begun by Mr. Robert Mont-
> “ gomerie, Schoolmaster in Kilmarnock, and Session-Clerk. He
> “ having begun one of the same kind before, anno 1705, which was
> “ carried on for some yeirs, and afterwards Lost when it was
> “ committed to another hand to keep.
>
> “ Ro. Montgomerie.”

Besides giving the total annual births, the register consists of a statement of the date, name and designation, age, and cause of death, of all who died in the parish of Kilmarnock, from March 1st, 1728, to March 1st, 1764. Why it ends so abruptly after these thirty-six years we do not know. Probably the old schoolmaster, whose hand had been getting gradually more unsteady as he penned the solemn record of so many deaths, at last himself went over to the majority, and no one seems to have taken up his well-worn quill to register the fact.*

The records of these thirty-six years are in every respect interesting, and in some points important. The population of Kilmarnock in 1763 is said to have been nearly 5,000. During the following 29 years it increased at the rate of about 64 per annum.† Supposing that during the period under consideration the annual increase were 45, the average population of the thirty-six years would not be more than 4,200. The average number of births per annum was 134. Now, the number of births since 1855 (the date of introduction of registration) has been 40 per annum to each 1,000 of the population. Calculated by this standard, the mean population in the thirty-six years would be 3,350. I will take 4,200, however, as being the correct number, so as to avoid the possibility of exaggerating the mortality from small-pox.

The total deaths in the period in question were 3,860, or at the rate of 24·36 per 1,000 per annum—fully 1 per 1,000 per annum above the average of the past twenty-five years. If the population were only 3,350, the death-rate would be 32 per 1,000 per annum.

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* A more careful examination of the orthography and penmanship of the record shows that there have been two, or perhaps three, successive compilers. Robert Montgomerie's share in it ceases at the end of May, 1736. His death, however, is not registered. Possibly he left the district at this time.

† M‘Kay's History of Kilmarnock, 4th edition, foot-note to p. 342.

The causes of death are shown in Table I., in which I have adopted the orthography of the old session-clerk.

TABLE I.

Mortality Table, 1728-1764, in groups of Six Years.

Disease.	1728-34.	1734-40.	1740-46.	1746-52.	1752-58.	1758-64.	Total.
Decay, - - - -	190	159	135	132	141	158	915
Age, - - - -	88	95	91	97	131	123	625
Small-pox, - - -	111	67	139	95	133	76	622
Fever, - - - -	99	80	96	88	95	87	545
Bowel-hive, - - -	33	46	35	48	49	63	274
Kinkhost or Cinkough, -	14	47	1	12	11	31	116
Closing, - - - -	...	5	29	30	33	9	106
Measles, - - -	1	11	18	52	4	7	93
Flux, - - - -	11	17	53	6	1	7	95
Childbed, - - -	11	4	4	10	16	14	59
Teething, - - -	12	12	4	6	5	16	55
Suddenly and Hastily, -	4	5	9	2	4	5	29
Consumption, - -	2	...	...	3	...	20	25
Gravel, - - - -	8	5	3	3	2	1	22
Dropsie, Hydropsie, and Swelling, - - -	6	2	2	5	4	3	22
Palsie, - - - -	4	4	3	5	...	3	19
Colick, - - - -	8	1	1	3	4	2	19
Tympany, - - -	2	2	4	2	6	1	17
Vomiting, - - -	12	2	...	...	...	...	14
Pleurisy and Stiches, -	1	2	1	1	5	2	12
King's Evil, Scrofula, and Cruels, - - -	5	...	3	...	...	2	10
Asthma, - - -	2	4	2	1	...	1	10
Gout, - - - -	1	5	4	...	...	...	10
Cancer, - - - -	2	1	1	1	1	1	7
6 each from Stoping and Purging, - - - - - - - -							12
5 ,, Fits and Convulsions, Accident, "Perished," - -							15
3 ,, Drowning, Lethargie, Scurvy, Rheumatism, and Rickets,							15
2 ,, Jaundice, Infancy, Apoplexy, Stone-cuting, Grief, Inflammation, - - - - - - - - - -							12
1 ,, Broken Leg, Cholera, Cold, Ulcer, Overlaid, Mortification, Hystirick, Poison, Gangren, Spina Ventosa, Self-murder, Worm Fever, Universal Gout, Blabs, Ague, Weakness, Bowel-ricket, - - - - - -							17
Disease Unknown (about), - -							68
Total, - - -							3,860

The flesh of Kilmarnock seems to have been heir to about 60 ills, and of these 4 are credited with fully two-thirds of the total deaths. At the head of the list is decay, with 915 deaths. What decay included it is difficult to say. That senility was not a necessary element is shown by the fact that deaths at the ages of one and two years are attributed to it. The term probably embraces nearly all chronic diseases causing emaciation and debility—among which, of course, consumption is the chief. The second disease is age, which, with its 625 deaths, has formed a convenient class for nearly all who lived over 70 years, and for a large number between 60 and 70 years. Passing over small-pox in the meantime, fever is responsible for 545 deaths. The town then, as now, was built on low-lying ground, by the side of a stream so small as to be nearly dry in summer, and quite insufficient for carrying off the impurities for which it would be the receptacle. The term seems to include scarlet fever, as it is not mentioned elsewhere, and also, perhaps, many cases of acute pneumonia, and other diseases running a rapid and febrile course. Bowel-hive is responsible for 273 deaths. The medical nomenclature of diseases in one generation may be said to be the popular nomenclature in the next. The bowel-hive of the doctors of the last century is now one of the most popular of children's diseases, and there is no mother worthy of the name who cannot tell all its symptoms and most of its treatment. It may be said to include most diseases of the stomach and bowels in infancy, and to be accountable for a very large number of the deaths during teething, and generally under three years of age. Kinkhost, or cinkough, stands next, with 116 deaths. Its leading symptom—the "kink" following the "host"—was so unmistakable, that its figures are in all likelihood quite correct. Closing (106 deaths) is the old name for croup. It was epidemic in 1745-6 (24 deaths) and 1746-7 (13 deaths). Previously to 1744 it is only once mentioned, but from that year onwards it figures regularly, with an annual average of 5 deaths. This sudden appearance of a new disease perhaps means the advent to the village of a new doctor, with the newest names, or else signifies an advance in the knowledge of the already-settled practitioners. The same may be said of consumption, which, curiously enough, is mentioned in the first year of the register, but does not turn up again for 19 years; and of its 25 deaths, 15 occurred in the last year—1763-4. Following closing, comes measles, of whose 93 deaths 52 occurred in one year—the next largest epidemics causing 14 and 11 fatalities respectively. Flux also caused 93 deaths, and probably means diarrhœa and dysentery (usually called bloody flux)—the latter a disease very well known in Kilmarnock even thirty or forty years ago, but one which promises to become an extinct species very soon. Childbed is accountable for 59 deaths. The small range of the numbers for each year—the highest being 4—seems to show an absence of epidemic puerperal disease; and the high general average of mortality is likely to have been due to bad midwifery practice, and especially to the want of the "forceps." Teething caused 55 deaths, and 29 died "suddenly" or "hastily"—this number doubtless including sudden deaths from heart disease and apoplexy. Three deaths from lethargie may also have been due to apoplexy. I have already referred to the 25 deaths from consumption. Twenty died from gravel. In connection with this, observe that 2 deaths resulted from "stone cuting" in 1738, so that lithotomy seems to have been occasionally performed. I have heard Dr. G. H. B. Macleod say that for many years the majority of cases of lithotomy in the Glasgow Royal Infirmary came from Kilmarnock and its neighbourhood. Calculus is certainly not exceptionally common now, the change being perhaps due to the substitution of a gravitation water-supply for that of the old surface wells. Dr. Borland informs me that he has heard his father say that when any serious operation, such as stone-cutting, had to be performed, surgeons come from Glasgow, usually in a "carriage-and-pair," and by way of Mearns Moor, and almost invariably on a Sunday. The event was looked on as of great general importance—crowds watched the arrival of the equipage and its mysterious inmates, and prayers were publicly offered in the churches for the success of the operation. Twenty deaths were owing to diseases variously named dropsie, hydropsie, and swelling, and 19 to palsie. Nineteen deaths from colick, and 17 from tympany, may represent enteritis and peritonitis, and perhaps a few cases of enteric fever—all these being accompanied by abdominal pain and flatulence. Fourteen deaths from vomiting, 12 from pleurisy or "stiches" (so named owing to the stitch-like character of the pain), 10 from king's evil, scrofula, and cruels united; 10 each from asthma and gout, and 7 from cancer, complete the principal figures. Gout is practically unknown now in Kilmarnock. Whether the home-brewed ale, or "caup yill," in which the glovers and wabsters of the old town delighted, was a beverage strong enough to bring on so aristocratic a complaint is a question I cannot answer. Certain it is that brewing was a common occupation, the designation "maltster" being by no means rare in the register.

The names of the remaining diseases, in most cases, explain themselves. "Stoping" was constipation, or ileus. The more interesting names are grief, cholera, hystirick, spina ventosa, self-murder, universal gout (or acute rheumatism), blabs, weakness, and bowel-ricket. Blabs probably meant chicken-pox, which used to be called "blab pox;" and the fact that it caused only one death in the thirty-six years rather confirms this view. Bowel-ricket meant, I believe, severe abdominal pain. Leaving this part of the subject with the remark that the whole register forms a rich mine of antiquarian lore, I turn now to the subject proper of the paper.

There can be no doubt but that small-pox caused more deaths, by a long way, than any other disease in old Kilmarnock. It is true that decay and age come before it in the list; but, as I have already pointed out, decay must include a great variety of diseases, and under the heading of age are placed, besides a number of deaths between the ages of 60 and 70, nearly all illnesses which proved fatal in those over 70 years—the old session-clerk evidently being a devout believer in the law which limits man's natural existence to three-score years and ten. Table II. may assist us in forming a mental picture as to the prevalence of small-pox in these old times. You will observe that epidemics occurred in 1728-9, 1733, 1736, 1740, 1744-5, 1749-50, 1754, 1757-8, and 1762—in all, nine epidemics in thirty-six years. In the intervals, the town was almost totally free from the disease. The average length of time between two epidemics was fully four years. They came with terrible regularity. If one or two were a little before their time, as in 1736 and 1740, the next were somewhat delayed, as in 1745 and 1750. The number of deaths varied from 45 to 95. You will notice that, on the whole, the extent of the epidemic corresponds—though not, of course, exactly—with the length of interval between the epidemics. Thus, the three largest (1754, 1749-50, and 1744-5) occurred after intervals of 4½ to 5 years: while previous to one of the mildest (1757-8) only 3 years and 2 months had elapsed. In 1733, however, there were only 45 deaths after a period of nearly 4½ years.

The epidemic of 1728 began on May 11th by a death in Beansburn, a hamlet on the outskirts of the town, and near the castle of the old barons of Kilmarnock. The next was on June 25th, in the same family; and the virulence of the disease came to a crisis in November, when, in a total of 23 deaths for the month, 17 were due to small-pox. It then gradually died out, ending with three

TABLE II.

Deaths from Small-pox, 1728-1764.

Year.	Total Deaths.	Age in Years at Death.							Age not Stated.
		Under 1.	1.	2.	3.	4.	5.	6 and Upwards.	
May 11th, 1728 to Feb. 29th, 1729	66	7	14	12	14	9	5	1 each aged 6, 11, 16, 22.	...
1730	...	...	...	...	..	...	...	...	1
1731	...	...	...	...	...	...	...	...	..
1732	...	...	...	...	...	...	...	...	...
Jan. 4th to Aug. 2nd, - 1733	45	12	9	13	6	4	...	1 aged 7.	...
1734	...	...	...	...	.	...	...	...	...
1735	...	...	...	...	...	...	...	...	...
July 16th to Dec. 20th, - 1736	66	12	20	20	8	1	1	3 aged 6, 1 aged 10.	...
1737	...	...	...	...	...	...	...	...	...
1738	...	...	...	...	...	...	. .	...	...
1739	...	...	...	...	...	...	...	...	...
Feb. 25th to Aug. 3rd, - 1740	66	15	21	9	14	2	2	1 aged 6, 1 aged 8.	1
1741	...	...	...	...	...	...	...	. .	...
1742	...	...	...	...	...	...	..	...	...
1743	...	...	...	...	...	...	...	..	...
Aug. 6th, 1744 to May 17th, 1745	74	15	13	19	11	10	2	1 each aged 6, 7, 9.	1
June 9th to Dec. 29th - 1746	8	3	2	1	1	...	...	1 aged 6.	...
1747	...	...	...	...	...	...	...	...	...
1748	2	...	...	1	1	...	...	...	.
Oct. 20th, 1749 to Mar. 15th, 1750	84	12	17	22	15	12	...	3 aged 6, 1 each aged 7 and 21.	1
1751	1	...	...	..	1	..	...	...	...
1752	...	..	...	...	...	...	...	...	...
1753	1	1	...	...	...	...	...	...	...
March 1st to Oct. 5th, - 1754	95	23	25	15	15	10	5	2 aged 7.	...
1755	...	...	...	...	...	...	...	...	...
1756	...	...	...	...	...	...	...	...	..
March 15th, 1757 to Sept. 5th, 1758	46	11	10	13	6	4	1	...	2
1759	..	...	...	...	...	...	...	...	...
1760	...	...	...	...	...	...	...	...	...
1761	...	...	...	...	...	...	...	...	...
March 5th to Aug. 30th, - 1762	66	7	15	10	9	10	8	2 aged 6, 1 each aged 9 and 20.	3
1763	2	...	...	1	...	...	...	1 aged 26.	...
Totals, - -	622	118	146	136	101	62	23	27	9

deaths in February. The second began in January, 1733, and ended on August 2nd, causing 45 deaths. There had been an interval of barely 4½ years since the last time. But in fully three years again the disease appeared—in July, 1736—and culminated in September, in which 23 deaths were due to it, among 30 from all causes; the total result being 66 deaths during the epidemic. It again appeared in February, 1740, and extended through the summer, ending on August 3rd, after having caused 66 deaths. The year ending February 28th, 1744, had been a very healthy one, only 55 deaths having occurred from all causes, or at the rate of 12 per 1,000 per annum. But, in the following August, pox again showed itself, and wrought deadly havoc throughout the winter, causing 74 deaths, of which 31 took place in January. It again raged from October, 1749, till March, 1750, causing 84 deaths, of which also 31 were in January. In the spring of 1754 the most severe of all the epidemics broke out, culminating in July and August, in which months there were respectively 39 and 33 deaths, in totals of 47 and 39 from all causes. The total mortality of the epidemic was 95. Two years and a-half after its close, another began; but the harvest was not ready for the sickle. The interval had been too short, and the outbreak never attained great violence, though it lingered on for the unprecedentedly long period of ~~two~~ 12 years, causing 45 deaths in all. But in four years more a new generation of children had arisen, and 66 of these succumbed to the destroyer. Between these various epidemics, a few occasional cases occurred, amounting to 14 in the thirty-six years.

As showing the severity of the scourge, I may state that, in 7 of the 9 epidemics, the year's death-rate was actually higher than the birth-rate—in one year to the extent of 72 per cent. The figures are given in Table III.

TABLE III.

Epidemic Years in which the Total Deaths exceeded the Total Births.

YEAR.	BIRTHS.	Deaths from all Causes.	Deaths from Small-pox.	Excess of Deaths over Births.
1728-9	111	162	66	51
1736-7	135	147	66	12
1740-1	95	164	65	69
1749-50	134	149	79	15
1754-5	146	203	95	57
1757-8	125	132	37	7
1762-3	132	173	66	41
Total,	878	1,130	474	252

It may be profitable to compare the greatest Kilmarnock epidemic of modern times with the greatest to be found in the old register. In the year ending May, 1874, 141 deaths from small-pox took place in a Kilmarnock of 24,000 inhabitants, being at the rate of 5·8 per 1000 living. In 1754, 95 deaths took place in a population of 4,200, or at the rate of 22·6 per 1,000 living. The old epidemic was therefore four times more severe than the modern one. And it is to be remembered that, while the former had only a period of 4½ years in which to collect its victims, no serious epidemic had occurred for upwards of thirty years previous to 1874. One can hardly conceive what would be said now-a-days about an ordinary annual death-rate as great as that of what we have learned to look on as a terrible epidemic—one which anti-vaccinationists held to prove the futility of Jenner's discovery. And yet an annual epidemic equal to that of 1873-4 would do little more than represent the condition of matters in the last century.

In all, 622 deaths resulted from small-pox in the 36 years. The total deaths from all causes were 3,860. Of every 1,000 deaths, therefore, 161 were owing to small-pox. The meaning of these figures can best be got at by comparison. Taking as a basis the statistics of the 26 years following the introduction of compulsory vaccination into England and Wales, the results are very striking. The small-pox death-rate per 100,000 per annum, in these 26 years, was 20·8. In Kilmarnock, last century, it was 410—that is, for every one death under the vaccination laws there were nearly 20 when vaccination was unknown. Again, of every 1,000 deaths in Kilmarnock, 161 were from small-pox, while in the 26 years ending 1879, only 9·9 per 1,000 were due to it, the proportion being 16 to 1 by this method of comparison.

I wish now to call your attention to an important series of facts brought to light by the old register—namely, as to the age of the victims of these numerous epidemics. Table IV. shows that from the height of the first epidemic to that of the second one, was a period of 4 years 8 months. And of the 45 children who succumbed in 1833, 44 were less than 4 years 8 months old, the remaining one being 7 years of age. Thus only one child that died in the 1733 epidemic had been alive previous to the height of the 1728 epidemic. The disease had to secure its victims almost wholly from the population that had come into existence since its last visitation. One epidemic left almost no victims for its successors—in the same way, hardly any had been left to it by its predecessors. It called at every door, and nearly

TABLE IV.

Date of Epidemic.	Interval since height of former Epidemic.	Total Deaths.	Deaths in Children born since height of former Epidemic.	Deaths in Children who had passed safely through one Epidemic.	Deaths in Individuals who had passed through more than one Epidemic.
1728-9	Unknown.	66	...	...	...
1733	4 yrs. 5 mons.	45	44	1	0
1736	3 ,, 5 ,,	66	58	7	1
1740	3 ,, 7 ,,	66	60	5	1
1744-5	4 ,, 8 ,,	74	67	6	1
1749-50	5 ,, 0 ,,	84	79	4	1
1754	4 ,, 6 ,,	95	84	11	0
1757-8	3 ,, 2 ,,	45	39	6	0
1762	4 ,, 8 ,,	66	53	11	2
Cases occurring between Epidemics,		14	8	5	1
TOTALS,		555	492 Or ~~85~~ per cent. 88·6	56 Or ~~11~~ per cent. 10	7 Or ~~1~~ per cent. 1·2

all who were not disease-proof came within its grasp. Those who recovered grew up disfigured for life; the names of the remainder are recorded in the old register book. The leading fact shown by Table IV. is that, on an average, over 88 per cent. of those who died in one epidemic had been born since the previous one, that 10 per cent. who died had passed safely through one epidemic, and that only 1 per cent. had lived through more than one outbreak. In the 36 years only 3 deaths occurred in people over 20 years of age, one a lad aged 20, another a married woman aged 21, and the third, a dragoon, aged 26 years, who, from his occupation and name (Aspdal), was probably an "incomer" to the town, as the old registrar calls strangers, to distinguish them from the "indwellers" or settled inhabitants.

Table V. shows that practically these epidemics, to nearly nine-tenths of their extent, did not occur in a population of 4,200, but in a population of 475 persons. And the average number of deaths in this population was 60, or at the very high rate of 126 per 1,000 living in each epidemic year. Now the number of attacks in unvaccinated children under 5 years of age is two for every death. As many die as recover. Therefore, of every 100 children born in Kilmarnock, no less than 25 were seized with small-pox at the first epidemic after their birth. Mr. Peter Taylor, M.P., President of the Anti-Vaccination Society, has

TABLE V.

Section of Population Born since former Epidemic.

Height of Epidemic.	Born since height of former Epidemic.	Died from various Diseases, excluding Small-pox.	Remaining to form field for new Epidemic.
May, 1733, - - -	614	90	524
Oct., 1736, - - -	476	82	394
May, 1740, - - -	501	89	412
Jan., 1745, - - -	506	68	438
Jan., 1750, - - -	634	107	527
July, 1754, - - -	648	131	517
Sept., 1757, - - -	445	41	404
May, 1762, - - -	690	110	580
Totals, - - -	4,514	718	3,796
Averages, - -	564	89	475

recently issued 200,000 copies of a pamphlet, which is said, by the *Edinburgh Evening News*, to be "by far the most staggering representation of the case against vaccination that has yet come before the public." In this pamphlet he says, "that one of the characteristics of the devotees to vaccination is enormously to exaggerate the prevalence of and mortality from small-pox in pre-vaccination periods." I wonder if Mr. Taylor knows of any "devotee" who ever pictured a greater prevalence of small-pox than I have proved to exist in Kilmarnock; and as to its mortality, if, as he says, only 18 deaths took place in every hundred attacks in the last century, at all ages (and in the 622 deaths in Kilmarnock only 2 were those of adults, so that, as to small-pox, childhood practically meant "all ages"), then we must come to the conclusion that in 1754, of 517 children, 466 were attacked; in 1745, of 438 children, 372 were attacked; and in 1736, of 394 children, 322 were attacked; and so on. These figures seem to me to greatly exaggerate the prevalence of the disease; but, if Mr. Taylor is right as to the rate of attacks to the mortality, he must also accept this legitimate result of his view. Tables IV. and V. show that, as regards small-pox, there were, in fact, three Kilmarnocks. One, a Kilmarnock of 3,700 persons, had no fear of its attacks. These had already met with and battled with the disease-fiend. On many were to be seen the marks of the conflict. Some were blind, some had lost their hearing, many were permanently injured in constitution, and very many were scarred and disfigured for life; and, for every one who had conquered, another had fallen never to rise again. There was, indeed, a second Kilmarnock under the green sod of the kirkyard. The Kilmarnock which had reason to dread the epidemic's approach was a Kilmarnock the least able to meet it. It consisted of a band of little children, numbering less than five hundred in all. Every such group that came into existence had to face, within four or five years of birth, the most terrible physical enemy that it would ever meet; and, having fought the battle, some were added to the maimed and distorted who formed so large a portion of the population, and others were laid beside those who had been destroyed by former epidemics. One can barely imagine what must have been the feelings of a mother regarding these fearful visitations. Even when the town was free of the pestilence, there would be the constant foreboding of its all too certain coming; and when at last the first case occurred—when the doctor was called in, and pronounced the disease to be the dreaded pox—his words would be heard as a sentence of death to some member of almost every family containing little ones; and, as the news spread from house to house, with what a despairing clutch would each mother press her darling to her breast, and beg Almighty God to command the destroying angel to pass by her door! After the lapse of a hundred and fifty years, one can have little conception of the real meaning of a small-pox epidemic. But the old parish registrar has enabled us to apprehend something of its horror; and I venture to say that, if the anti-vaccinationists had their will, we would ere many years be again experiencing somewhat of the awful visitations which were so familiar in old Kilmarnock.

By the English life tables I find that, of every thousand children born alive, 2·3 may be expected to die of small-pox before reaching five years of age. In Kilmarnock, 116 of every thousand born were fated to die of the malady under the same age. This comparison gives the startling proportion of 1 to 35. I have stated above that the proportion at all ages is 1 to 16 or 20; and the meaning of the difference between 16 or 20, and 35, is simply this—that vaccination gives a protection much greater in childhood than in after-life; and, if re-vaccination were insisted on at adolescence, I see no reason to doubt that 35 to 1 might become the proportion all through life.

The earliest age at which the register shows small-pox to have proved fatal was 20 days, the greatest 26 years. By looking at the summations of the columns in Table II. you will see the number of deaths at each year of age. The mean age of those under 1 year was 7½ months. The mean or average age at death, of all the cases, was 2·62 years. In England, from 1848 to 1872, the mean age was 11·9 years. The difference between 2·62 and 11·9 is sufficiently striking. But in the earlier part of the 25 years 1848-72, vaccination was not compulsory. From data furnished me by Dr. Robertson, of the Register House, Edinburgh, I am enabled to state that the mean age at death, in Scotland, in the years 1873-4-5, was 19·7 years; and to Dr. Ogle of Somerset House, I am indebted for the fact that "the mean age of the 14,554 persons who died from small-pox in England and Wales, during the seven years 1872-79, has been found to be 19·98, or almost twenty years." Now, small-pox is a much more fatal disease in infancy than in manhood. In unvaccinated children under five years old, one dies in every two attacked. In youths from 15 to 20, one dies in four; so that even if infant vaccination made an attack of small-pox no milder, it would still have the great merit of deferring it till the poison-resisting power of nature is at, or at least nearer to, its maximum. And if vaccination did nothing else, it would obviously confer an enormous boon on humanity, in increasing by 17 years the life of those who do finally succumb to the ravages of small-pox. In the absence of primary vaccination death occurs at an average of 2½ years after the birth of the child. In the absence of re-vaccination death takes place at an average of about four years after puberty. It is, of course, easily possible to be led astray by averages, but granting this, these facts still point to the propriety of re-vaccination at adolescence. This is also shown by statistics of deaths in Kilmarnock since 1855. From 1855 to 1864 inclusive, vaccination was optional, and by no means universally performed, and the mean age at death was 4·38 years. From 1865, when the Compulsory Vaccination Act for Scotland came into force, to 1879, inclusive, the mean age has been 20·1 years. This last rate practically refers to the epidemic of 1873-4 as after 1865 no death took place in Kilmarnock for six years. During the epidemic there were 141 deaths. Of the 2,4000 inhabitants over 3,000 were re-vaccinated. And, so far as I can learn, not one re-vaccinated person was attacked by the disease. Certainly not one died of it. This is a very remarkable fact. The 3,000 among the 24,000 were like the Israelites in Egypt, when, with their lintels and door-posts stained with blood, they were passed over by the angel of death on his visit of desolation to the households of their oppressors.

I have said that the average age of those under one year was, in Kilmarnock, 7½ months. Now, Dr. Robertson, of Edinburgh, made, in one of the Registrar's blue books, a very interesting comparison as to the deaths of children under one year old. He found that from 1855 to 1864, when vaccination was only optional, the number of deaths from small-pox in children under one year old was very nearly equally divided between the two halves of the year. But when vaccination became compulsory at the age of six months, this grouping altered very much—about 79 per 100 being under 6 months, and only 21 between 6 and 12 months. The inference was that vaccination made the difference. But a third fact was needed to complete the comparison, namely, the proportion in each of the two half years when vaccination was totally unknown. This is supplied by the Kilmarnock statistics, and Table VI. gives the result.

TABLE VI.

Ratio of Deaths from Small-pox between 6 and 12 Months of Age, to 100 Deaths from Small-pox under 6 Months, during three Selected Periods.

AGE.	1728-1763. Kilmarnock. Vaccination Unknown.	1855-1864. Scotland. Vaccination Optional.	1865-1879. Scotland. Vaccination Compulsory.
Under 6 months, - -	100	100	100
From 6 to 12 months, -	491	103	26

The first ratio may be taken as the normal one of natural small-pox. It is a disease nearly five times as fatal in the second as in the first six months of life. But when modified in the second six months, by optional vaccination, the mortality decreases very much—from 491 to 103. And when vaccination becomes compulsory, as in the third period, the 103 becomes reduced to 26. This second half year is the first part of life on which the influence of vaccination is brought to bear on the prevalence of small-pox, and the result is a very clear proof of the value of the compulsory law.

One question remains to be considered—How far the decrease in small-pox mortality is to be attributed to causes other than vaccination? I am quite prepared to grant that improved hygiene and treatment have exercised considerable effect in this direction. But they obviously have no bearing on the facts shown in Table VI. And that they account for anything more than a fraction of the enormous general improvement—an improvement at the rate of nearly 20 to 1—I distinctly deny. The following Table shows the decrease that has taken place in the mortality from various zymotic diseases since last century:—

TABLE VII.

Rate per 1,000 per Annum of Deaths from certain Zymotic Diseases in Kilmarnock in 1728-64, and in England and Wales in Recent Periods.

DISEASE.	Rate in Kilmarnock, 1728-64.	Rate in England.	Rate of Decrease.
Measles, - -	·615	(1861-71) ·4399	100 to 70
Whooping-cough,	·7671	,, ·5273	100 to 68
Fever (including Scarlatina), -	3·4722	,, 1·8474	100 to 53
Small-pox, - -	4·1071	(1854-79) ·208	100 to 5

Deaths from small-pox, therefore, have decreased 14 times faster than from measles, 13 times faster than from hooping-cough, and 10 times faster than from fever.

In conclusion, allow me to re-state the chief facts I have endeavoured to set forth.

(1) Small-pox was epidemic in Kilmarnock every 4¼ years.

(2) Its death-rate per 1,000 per annum was nearly 20 times greater than it now is.

(3) Its death-rate under 5 years of age was 35 times greater than it now is.

(4) The mean age at death from small-pox was 2½ years in the last century, and is now nearly 20 years.

(5) The death-rate from small-pox in the second half year of life is now only a fourth of that in the first half year, while formerly, in the second half year, it was nearly 5 times as great as in the first half year.

(6) The small-pox death-rate has improved about 12 times as fast as the death-rate from measles, hooping-cough, and fever.